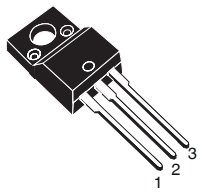
# STF45N10F7

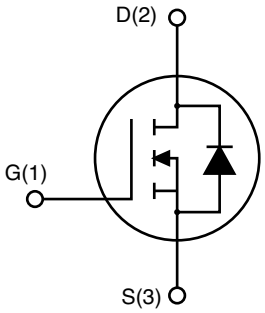
## N-channel 100 V, 0.0145 Ω typ., 30 A, STripFET™ VII DeepGATE™ Power MOSFET in a TO-220FP package

**Datasheet - production data**




**TO-220FP**

**Figure 1. Internal schematic diagram**




## Features

| Order code | $V_{DS}$ | $R_{DS(on)}$ max.(1) | $I_D$ | $P_{TOT}$ |
|---|---|---|---|---|
| STF45N10F7 | 100 V | 0.018 Ω | 30 A | 25 W |

1. @ VGS = 10 V

- Ultra low on-resistance
- 100% avalanche tested

## Applications

- Switching applications

## Description

This device utilizes the 7th generation of design rules of ST's proprietary STripFET™ technology, with a new gate structure. The resulting Power MOSFET exhibits the lowest $R_{DS(on)}$ in all packages.

**Table 1. Device summary**

| Order codes | Marking | Package | Packaging |
|---|---|---|---|
| STF45N10F7 | 45N10F7 | TO-220FP | Tube |



This is information on a product in full production. www.st.com

# Contents

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2 Electrical characteristics . . . . . 4

2.1 Electrical characteristics (curves) . . . . . 6

3 Test circuits . . . . . 8

4 Package mechanical data . . . . . 9

5 Revision history . . . . . 12

# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{DS}$ | Drain-source voltage | 100 | V |
| $V_{GS}$ | Gate-source voltage | 20 | V |
| $I_D$ | Drain current (continuous) at $T_C$ = 25 °C | 30 | A |
| $I_D$ | Drain current (continuous) at $T_C$ = 100 °C | 21.4 | A |
| $I_{DM}$(1) | Drain current (pulsed) | 120 | A |
| $P_{TOT}$ | Total dissipation at $T_c$ = 25 °C | 25 | W |
| $V_{ISO}$ | Insulation withstand voltage (RMS) from all three leads to external heat sink (t=1 s;TC=25 °C) | 2500 | V |
| $T_J$ | Operating junction temperature | -55 to 175 | °C |
| $T_{stg}$ | Storage temperature | | °C |

1. Pulse width limited by safe operating area.

**Table 3. Thermal resistance**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $R_{thj\text{-}case}$ | Thermal resistance junction-case | 6 | °C/W |
| $R_{thj\text{-}amb}$ | Thermal resistance junction-ambient | 62.5 | °C/W |

# 2 Electrical characteristics

($T_{CASE}$ = 25 °C unless otherwise specified)

**Table 4. On/off states**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage ($V_{GS}$= 0) | $I_D$ = 1 mA | 100 | | - | V |
| $I_{DSS}$ | Zero gate voltage drain current ($V_{GS}$ = 0) | $V_{DS}$ = 100 V | | | 10 | µA |
| | | $V_{DS}$ = 100 V; $T_C$ =125 °C | | | 100 | µA |
| $I_{GSS}$ | Gate body leakage current ($V_{DS}$ = 0) | $V_{GS}$ = 20 V | | | 100 | nA |
| $V_{GS(th)}$ | Gate threshold voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 µA | 2.5 | | 4.5 | V |
| $R_{DS(on)}$ | Static drain-source on-resistance | $V_{GS}$ = 10 V, $I_D$ = 15 A | | 0.0145 | 0.018 | Ω |

**Table 5. Dynamic**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $C_{iss}$ | Input capacitance | $V_{DS}$ = 50 V, f =1 MHz, $V_{GS}$ = 0 | - | 1640 | - | pF |
| $C_{oss}$ | Output capacitance | | - | 360 | - | pF |
| $C_{rss}$ | Reverse transfer capacitance | | - | 25 | - | pF |
| $Q_g$ | Total gate charge | $V_{DD}$ = 50 V, $I_D$ = 30 A $V_{GS}$ = 10 V *Figure 14* | - | 25 | - | nC |
| $Q_{gs}$ | Gate-source charge | | - | 5.1 | - | nC |
| $Q_{gd}$ | Gate-drain charge | | - | 12.2 | - | nC |

**Table 6. Switching times**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $t_{d(on)}$ | Turn-on delay time | $V_{DD}$ = 50 V, $I_D$ = 15 A, $R_G$ = 4.7 Ω, $V_{GS}$ = 10 V *Figure 13* | - | 15 | - | ns |
| $t_r$ | Rise time | | - | 17 | - | ns |
| $t_{d(off)}$ | Turn-off delay time | | - | 24 | - | ns |
| $t_f$ | Fall time | | - | 8 | - | ns |

**Table 7. Source-drain diode**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_{SD}$ | Source-drain current | | - | | 30 | A |
| $I_{SDM}$ (1) | Source-drain current (pulsed) | | - | | 120 | A |
| $V_{SD}$ (2) | Forward on voltage | $I_{SD}$ = 30 A, $V_{GS}$ = 0 | - | | 1.1 | V |
| $t_{rr}$ | Reverse recovery time | $I_{SD}$ = 30 A, di/dt = 100 A/µs, $V_{DD}$ = 80 V, $T_j$ = 150 °C | - | 53 | | ns |
| $Q_{rr}$ | Reverse recovery charge | | - | 67 | | nC |
| $I_{RRM}$ | Reverse recovery current | | - | 2.5 | | A |

1. Pulse width limited by safe operating area.
2. Pulsed: pulse duration=300 µs, duty cycle 1.5%.

## 2.1 Electrical characteristics (curves)

**Figure 2. Safe operating area**

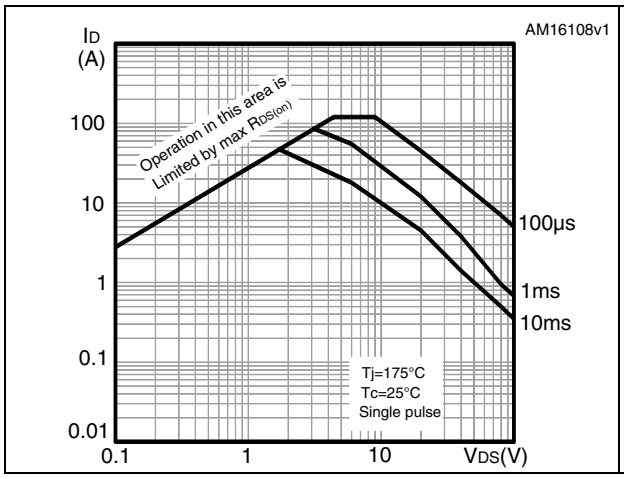



**Figure 3. Thermal impedance**

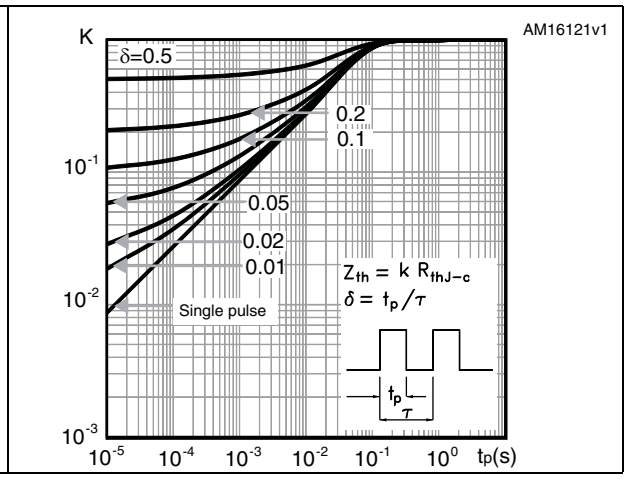



**Figure 4. Output characteristics**

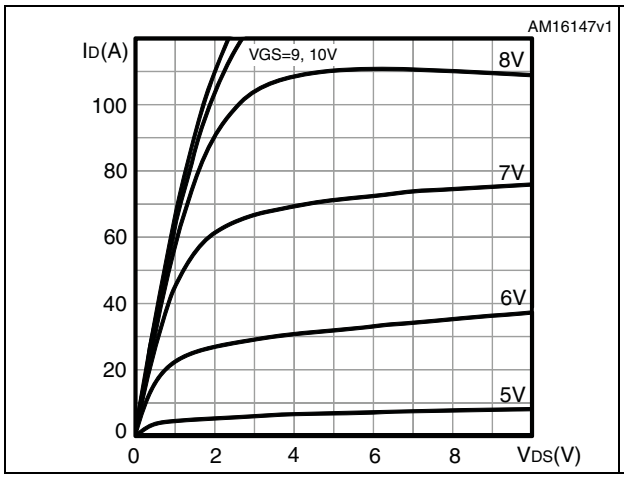



**Figure 5. Transfer characteristics**

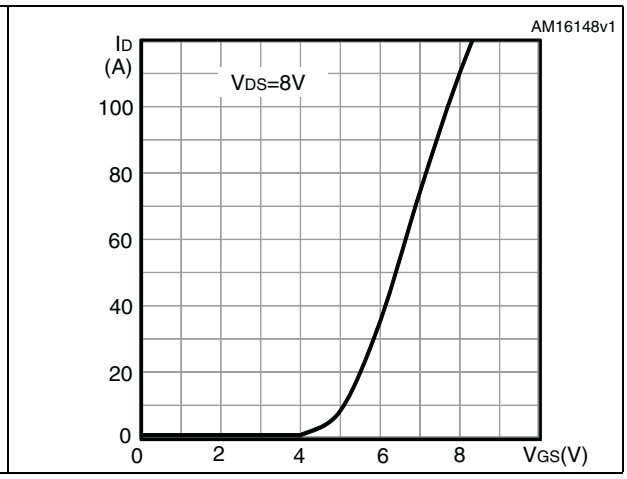



**Figure 6. Gate charge vs gate-source voltage**

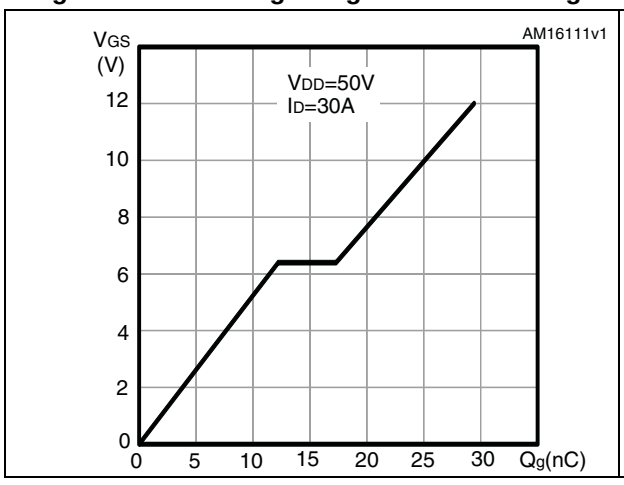



**Figure 7. Static drain-source on-resistance**

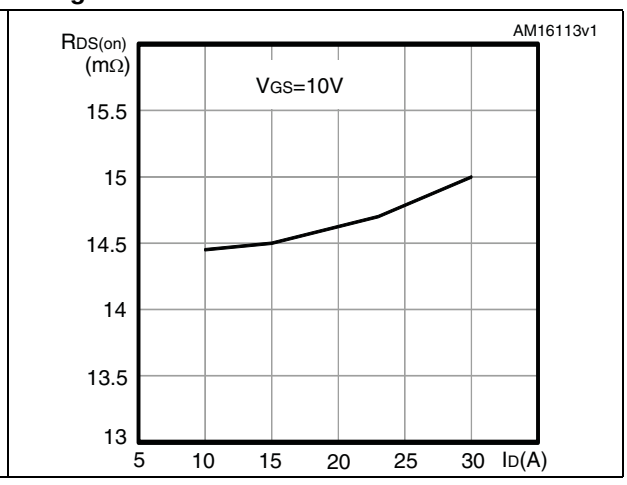


**Figure 8. Capacitance variations**

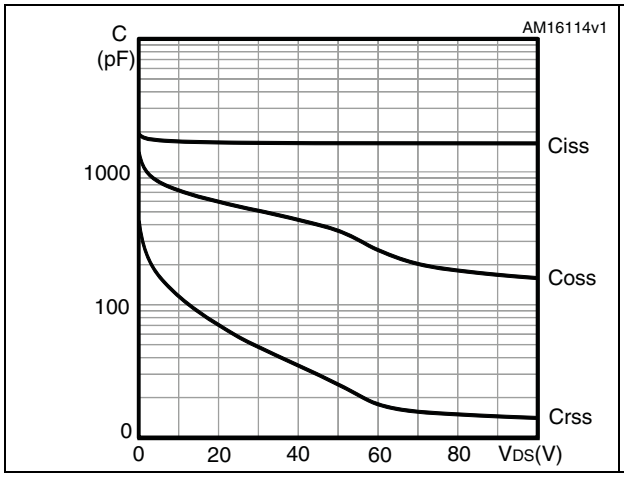



**Figure 9. Normalized gate threshold voltage vs temperature**

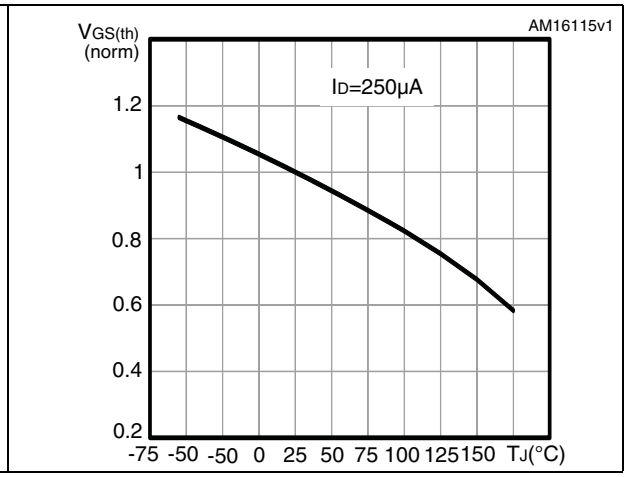



**Figure 10. Normalized on-resistance vs temperature**

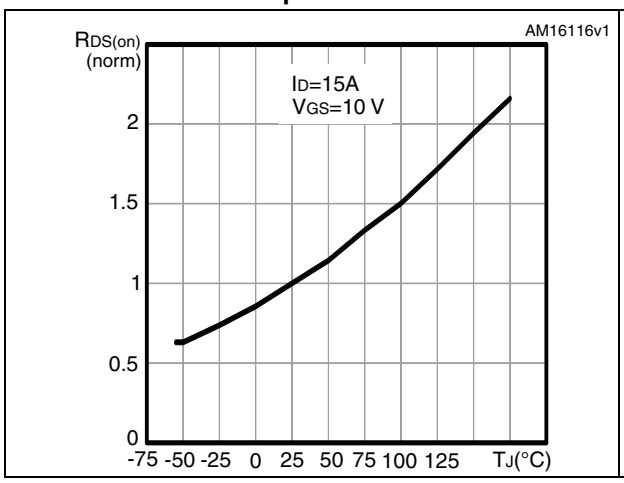



**Figure 11. Normalized $V_{(BR)DS}$ vs temperature**

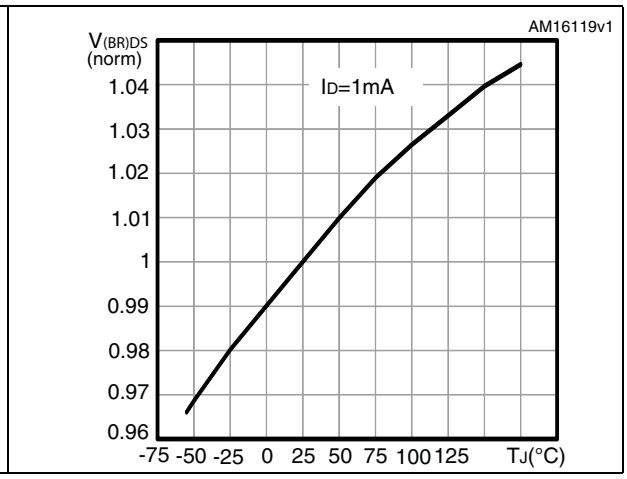
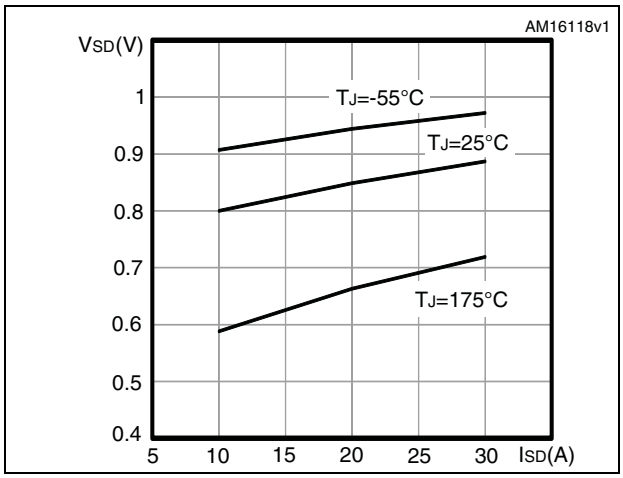



**Figure 12. Source-drain diode forward characteristics**



# 3 Test circuits

**Figure 13. Switching times test circuit for resistive load**

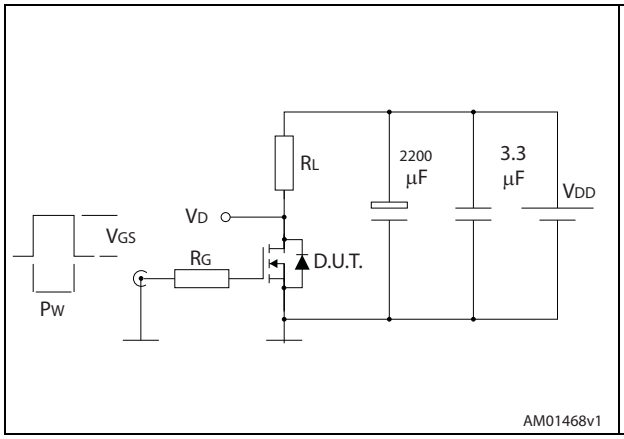



**Figure 14. Gate charge test circuit**

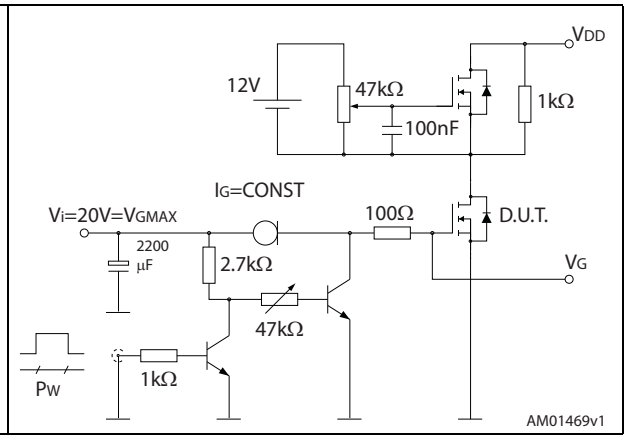



**Figure 15. Test circuit for inductive load switching and diode recovery times**

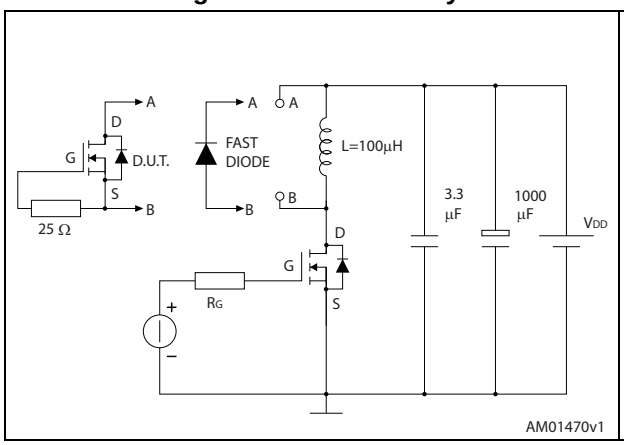



**Figure 16. Unclamped inductive load test circuit**

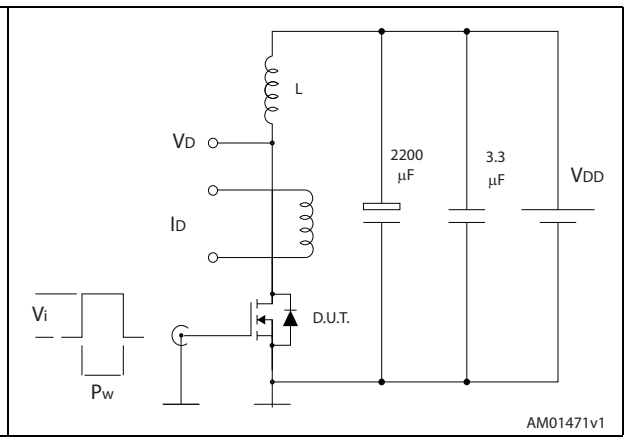



**Figure 17. Unclamped inductive waveform**

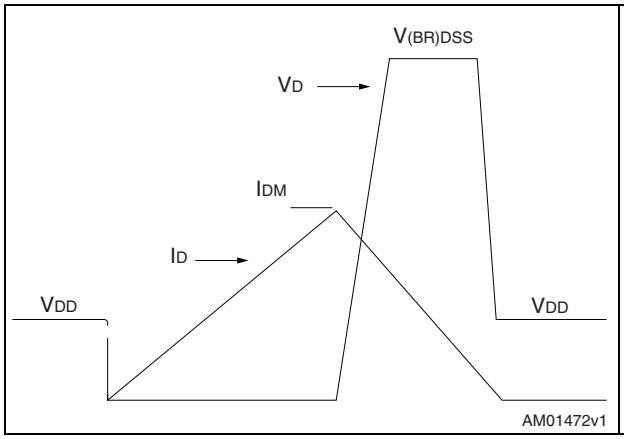
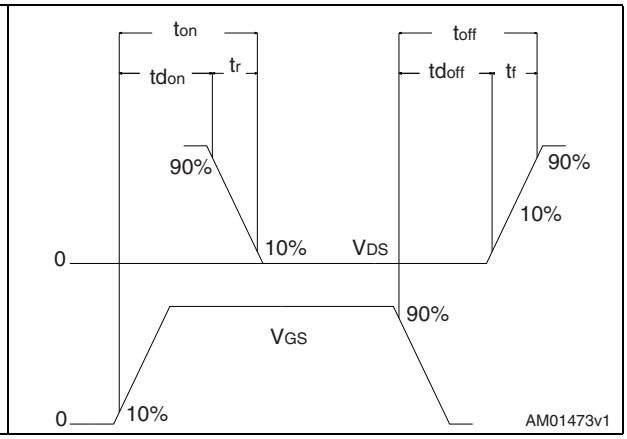



**Figure 18. Switching time waveform**



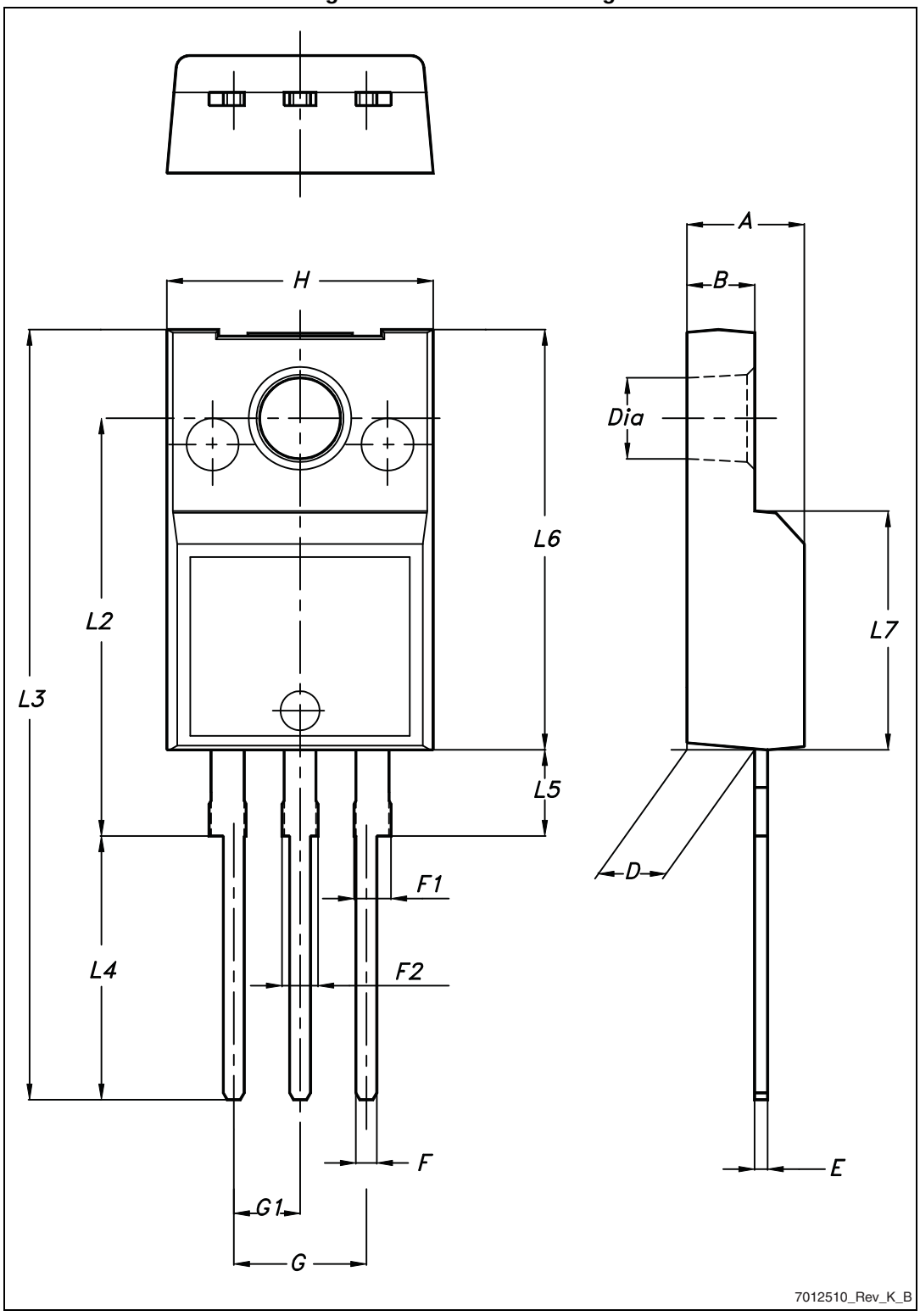
# 4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: *www.st.com*.
ECOPACK® is an ST trademark.

Table 8. TO-220FP mechanical data

| Dim. | mm | | |
|---|---|---|---|
| | Min. | Typ. | Max. |
| A | 4.4 | | 4.6 |
| B | 2.5 | | 2.7 |
| D | 2.5 | | 2.75 |
| E | 0.45 | | 0.7 |
| F | 0.75 | | 1 |
| F1 | 1.15 | | 1.70 |
| F2 | 1.15 | | 1.70 |
| G | 4.95 | | 5.2 |
| G1 | 2.4 | | 2.7 |
| H | 10 | | 10.4 |
| L2 | | 16 | |
| L3 | 28.6 | | 30.6 |
| L4 | 9.8 | | 10.6 |
| L5 | 2.9 | | 3.6 |
| L6 | 15.9 | | 16.4 |
| L7 | 9 | | 9.3 |
| Dia | 3 | | 3.2 |

Figure 19. TO-220FP drawing



# 5 Revision history

Table 9. Document revision history

| Date | Revision | Changes |
|---|---|---|
| 03-Dec-2012 | 1 | First release. |
| 06-Dec-2012 | 2 | Minor text changes<br>The part number STH110N10F7-2 has been moved to a separate datasheet<br>The part number STP110N10F7 has been moved to a separate datasheet |
| 11-Nov-2013 | 3 | Document status promoted from preliminary to production data. |

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